

LESSON 9 ASSEMBLING YOUR “TOOL BOX”

DRILLED SHAFT FOUNDATION INSPECTION

DECEMBER 2002

Participant Workbook

Participant Workbook

LESSON 9

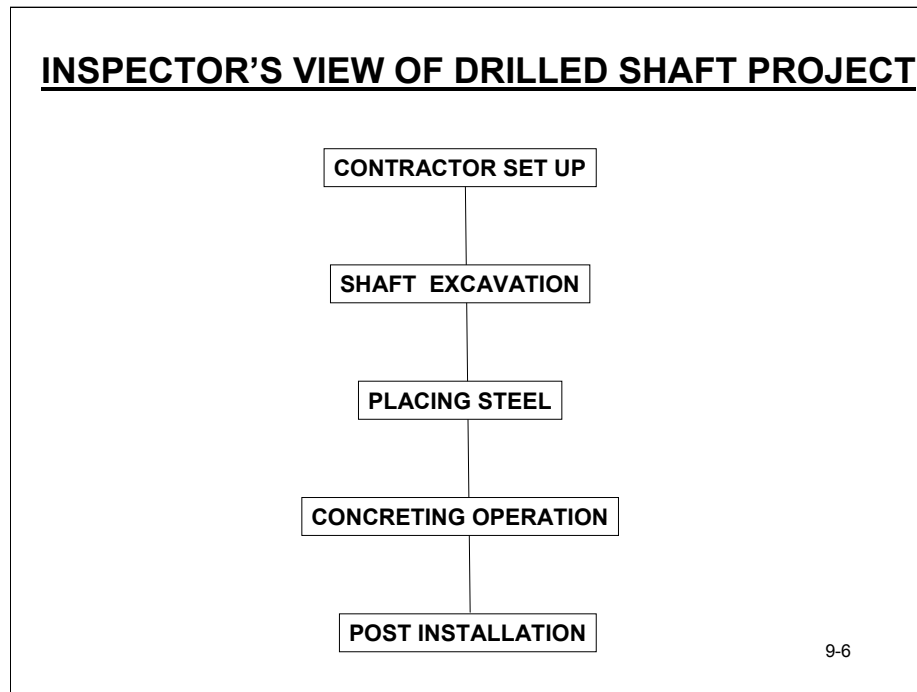
ASSEMBLE YOUR TOOL BOX

9-4

LEARNING OBJECTIVES

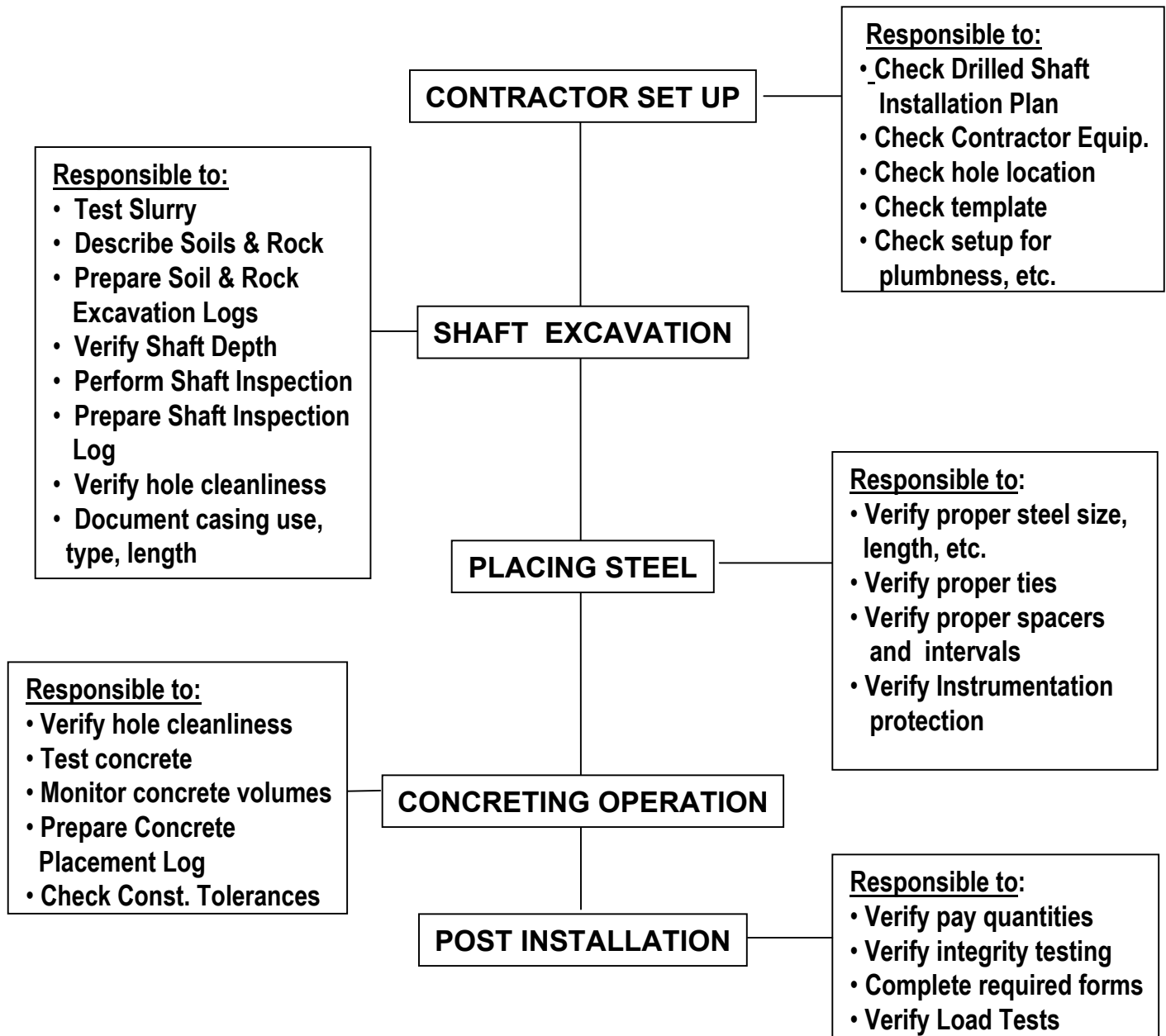
- **Identify the documents and tools needed by the Inspector**
- **Describe the importance of the Pre-construction meeting.**

9-5



See following full size version.

THE INSPECTOR'S VIEW OF A DRILLED SHAFT PROJECT



INSPECTOR’S “TOOLS” CHECKLIST

**Checklists Prevent
Our Forgetting**

SAMPLE INSPECTOR’S “TOOLS” CHECKLIST

Approved Job Information

- ☐ Project Plans & Specifications w/ Revisions
- ☐ Special Provisions & Technical Special Provisions
- ☐ Drilled Shaft Installation Plan

References

- ☐ Standard Specifications
- ☐ Drilled Shaft Inspector's Manual (Local Department)
- ☐ Drilled Shaft Inspector's Qualification Course Manual (NHI #132070)

Testing Equipment

- ☐ Sampler
- ☐ Sand Content Testing Equipment
- ☐ Mud Density Test Equipment
- ☐ Viscosity Test Equipment

Blank Forms

- ☐ Drilled Shaft Soil/Rock Excavation Log
- ☐ Drilled Shaft Rock Core Log
- ☐ Drilled Shaft Inspection Log
- ☐ Concrete Placement Log
- ☐ Concrete Volume Form
- ☐ Drilled Shaft Log
- ☐ Drilled Shaft Construction & Pay Summary

Daily Essentials

- ☐ Hard Hat
- ☐ Boots
- ☐ Ear & Eye Protection
- ☐ Pen / Pencil (with spare)
- ☐ 12' Tape (Preferably 25')
- ☐ 150' Tape
- ☐ Builders Square
- ☐ Life Jacket or reflective jacket
- ☐ Watch
- ☐ Calculator
- ☐ Camera
- ☐ Scale
- ☐ Level
- ☐ Weighted Tape (100')
- ☐ Plumb bob

See following full size version.

SAMPLE INSPECTOR'S "TOOLS"

CHECKLIST

Approved Job Information

- ☐ Project Plans & Specifications
w/ Revisions
- ☐ Special Provisions & Technical
Special Provisions
- ☐ Drilled Shaft Installation Plan

References

- ☐ Standard Specifications
- ☐ Drilled Shaft Inspector's
Manual (Local Department)
- ☐ Drilled Shaft Inspector's
Qualification Course Manual
(NHI #132070)

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Testing Equipment

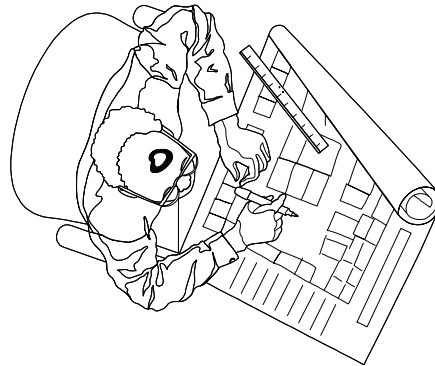
- ☐ Sampler
- ☐ Sand Content Testing
Equipment
- ☐ Mud Density Test Equipment
- ☐ Viscosity Test Equipment

Blank Forms

- ☐ Drilled Shaft Soil/Rock Excavation Log
- ☐ Drilled Shaft Rock Core Log
- ☐ Drilled Shaft Inspection Log
- ☐ Concrete Placement Log
- ☐ Concrete Volume Form
- ☐ Drilled Shaft Log
- ☐ Drilled Shaft Construction & Pay Summary

REVIEW THE PROJECT DOCUMENTS

Review Project Documents
and come up to speed
as quickly as possible.



9-10

The designers have lived with this project for years and the Contractor became very knowledgeable of the project during the bidding process. Whereas the Inspector is almost brought in at the last moment and therefore is the least knowledgeable of the project specifics. It is imperative that the Inspector come up to speed as quickly as possible.

KEY PARTS OF THE PLANS & SPECIFICATIONS

COMPONENT	CHECK
Plan Revisions	Always check for revised sheets to see if there are any changes that affect the shaft construction.
Key Sheet	Does Project ID No., location, etc. agree with the information you were provided?
Const. Est. Sheet	Do the pay quantities and items agree?

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KEY PARTS OF THE PLANS & SPECIFICATIONS

COMPONENT	CHECK
Utilities	Does there appear to be any conflicts with production or test shafts? If so, are there provisions for addressing these conflicts?
Traffic Control	Does there appear to be any conflicts with production or test shafts? Does the sequence of shaft installation conflict? If so, are there provisions for addressing these conflicts?

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KEY PARTS OF THE PLANS & SPECIFICATIONS

STRUCTURAL PLANS	CHECK
General Notes	Compare with the Drilled Shaft Data Table. Do any “Notes” contain changes to the specifications or specification applications?
General Plan & Elevation	Does the number of bent/piers or shaft locations match the Drilled Shaft Data Table? Do the elevations shown compare favorably with the Drilled Shaft Data Table?

9-13

KEY PARTS OF THE PLANS & SPECIFICATIONS

STRUCTURAL PLANS	CHECK
Bridge Hydr. Sheet	Are the scour elevations shown? Do they match the Drilled Shaft Data Table?
Rpt. of Borings	Are water tables/piezometric levels shown? Do the boring(s) extend beyond the proposed bottom of shaft elevations?
Foundation Layout	Does the foundation layout match the Drilled Shaft Installation Plan relating to number, sequencing, elevations,etc.?

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LEARNING OBJECTIVE # 1

Identify the documents and tools needed by the Inspector

Which Structural Plans should the Inspector review?

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LEARNING OBJECTIVE # 1

Identify the documents and tools needed by the Inspector

In addition to the Project Plans & Specifications, what are some of the other documents the Inspector should have?

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TYPICAL INSPECTION FORMS**Drilled Shaft Soil/Rock Excavation Log****Drilled Shaft Rock Core Log****Drilled Shaft Inspection Log****Concrete Placement Log****Concrete Volumes Form****Drilled Shaft Log****Drilled Shaft Construction & Pay Summary**

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Forms will vary by local agencies but herein are sample forms containing the information typically requested.

Do not go to the jobsite without them.

Drilled Shaft Soil/Rock Excavation Log- This is the form used to log the shaft excavation.

Drilled Shaft Rock Core Log- This is the form used to log the sampling beneath the bottom elevation of the shaft that is required.

Drilled Shaft Inspection Log- This form is used for the inspection of the shaft once excavated.

Concrete Placement Log- This is the form used to record the concrete placed into the shaft.

Concrete Volumes Form- This form is used to plot the concrete volume being placed versus the shaft's theoretical concrete volume.

Drilled Shaft Log- This form is used to summarize and provide the data on how the shaft was constructed.

Drilled Shaft Construction and Pay Summary- This form is used to record the pay quantities.

SAMPLE DRILLED SHAFT INSPECTION CHECKLIST

SAMPLE DRILLED SHAFT INSPECTOR'S CHECKLIST

The following is a general checklist to follow when constructing a Drilled Shaft. The answer to each of these should be "yes" unless plans, specifications or specific approval has been given otherwise. CONSULT WITH RESPONSIBLE ENGINEER FOR YOUR SPECIFIC PROJECT RESPONSIBILITIES.

Contractor & Equipment Arrive On-Site		Yes	No
1. Has the contractor submitted his drilled shaft installation plan (xxx.12, Submittal)?		31	31
2. Has the Drilled Shaft Installation Plan been approved?		31	31
3. Does the contractor have an approved concrete mix design (xxx.60, Concrete Placement)?		31	31
4. Has the contractor run the required Trial Mix and slump loss test for his drilled shaft mix design (xxx.60, Concrete Placement)?		31	31
5. If concreting is estimated to take over two hours, has the contractor performed a satisfactory slump loss test for the extended time period in accordance with xxx.60, Concrete Placement?		31	31
6. If the Contractor proposed a blended mineral-polymer or a polymer slurry, do they have an approved Slurry Management Plan (xxx.38, Slurry)?		31	31
7. Is the Contractor prepared to take soil samples or rock cores on the bottom of the shaft in accordance with xxx.35.5, Excavations?		31	31
8. Has the contractor met the requirements of xxx.30.1, Protection of Existing Structures?		31	31
9. Has the site preparation been completed for footing in accordance with xxx.30.2, Construction Sequence?		31	31
10. If a cofferdam is required, does the contractor have a qualified diver and safety diver for inspections in accordance with xxx.35, Excavations?		31	31
11. Does the contractor have all of the equipment and tools shown in his drilled shaft installation plan to install the drilled shaft?		31	31
12. If casing is to be used, is it the correct size in accordance with xxx.36, Casing?		31	31
13. If the contractor plans on using a manufactured slurry, does he have the equipment to mix it?		31	31
14. Is a desander required (xxx.38, Slurry)?		31	31
15. If a desander is required, does the contractor have it on site and operational?		31	31
16. Does the contractor's license meet the requirements of xxx.61, Trainers?		31	31
17. Do you have the required drilled shaft forms that need to be field set during shaft construction?		31	31
18. Do you understand the forms (if not, contact the responsible engineer for help)?		31	31
Trial Shaft			
19. Is the trial shaft positioned away from the production shafts or as in the contract documents (xxx.13 Trial Shaft Installation)?		31	31
20. Has the contractor performed a successful test hole in accordance with xxx.31, Trial Shaft Installation?		31	31
21. Did the Contractor cut off the shaft 2 feet (0.6 m) below grade in accordance with xxx.13, Trial Shaft Installation?		31	31
22. Has the contractor revised his technique and equipment (and the revision is approved) to successfully construct a shaft?		31	31
Shaft Excavation & Cleaning			
23. Is the shaft being constructed in the correct location & within tolerance (xxx.41, Tolerances)?		31	31
24. Does the contractor have a bench mark so the shaft can be constructed and inspected to the proper elevations?		31	31
25. If a core hole is required, has the contractor taken them in accordance with xxx.35.5, Excavations?		31	31
26. If a core hole was performed, was the Rock Core Form completed and the Contractor maintained a log (xxx.35, Excavations)?		31	31
27. If the contractor is using slurry, can they perform tests and report the results in accordance with xxx.38, Slurry?		31	31
28. Is the slurry level being properly maintained in accordance with xxx.38, Slurry?		31	31
29. Is the proper type and number of tests being run on the slurry in accordance with xxx.38, Slurry?		31	31
30. Are you filling out the Soil/Rock Excavation forms?		31	31
31. If permanent casing is used, does it meet xxx.36 & 36.2, Casing?		31	31
32. If temporary casing is being used, does it meet xxx.36.1, Temporary Casing?		31	31
33. If belling is required, does it meet the requirements of xxx.35, Excavations?		31	31
34. Is the Contractor maintaining an excavation log in accordance with xxx.35, Excavations?		31	31
35. Is the shaft within allowable vertical alignment tolerances (xxx.41, Construction Tolerances)?		31	31
36. Is the shaft of proper depth?		31	31
37. Does the shaft excavation time meet the specified time limit (xxx.34, Excavation & Drilling Equipment)?		31	31
38. If the shaft required over reaming, was it performed in accordance with xxx.34, Excavation & Drilling Equipment?		31	31
39. Does the shaft bottom meet the requirements of xxx.40, Excavation Inspection?		31	31
40. Did you complete the Shaft Inspection Form?		31	31

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Full-size version follows.

SAMPLE DRILLED SHAFT INSPECTOR'S CHECKLIST

The following is a general checklist to follow when constructing a Drilled Shaft. The answer to each of these should be "yes" unless plans, specifications or specific approval has been given otherwise **CONSULT WITH RESPONSIBLE ENGINEER FOR YOUR SPECIFIC PROJECT RESPONSIBILITIES.**

Contractor & Equipment Arrive On-Site	Yes	No	NA
1. Has the contractor submitted his drilled shaft installation plan (xxx.12, Submittals) ?	1	1	
2. Has the Drilled Shaft Installation Plan been approved ?	2	2	
3. Does the contractor have an approved concrete mix design (xxx.60, Concrete Placement)?	3	3	
4. Has the contractor run the required Trial Mix and slump loss test for his drilled shaft mix design (xxx.60, Concrete Placement)?	4	4	
5. If concreting is estimated to take over two hours, has the contractor performed a satisfactory slump loss test for the extended time period in accordance with xxx.60, Concrete Placement?	5	5	
6. If the Contractor proposed a blended mineral-polymer or a polymer slurry, do they have an approved Slurry Management Plan (xxx.38, Slurry)?	6	6	
7. Is the Contractor prepared to take soil samples or rock cores on the bottom of the shaft in accordance with xxx.35.5, Excavations?	7	7	
8. Has the contractor met the requirements of xxx.30.1, Protection of Existing Structures?	8	8	
9. Has the site preparation been completed for footing in accordance with xxx.30.2, Construction Sequence?	9	9	
10. If a cofferdam is required, does the contractor have a qualified diver and safety diver for inspections in accordance with xxx.35, Excavations?	10	10	
11. Does the contractor have all of the equipment and tools shown in his drilled shaft installation plan to install the drilled shaft?	11	11	
12. If casing is to be used, is it the correct size in accordance with xxx.36, Casing?	12	12	
13. If the contractor plans on using a manufactured slurry, does he have the equipment to mix it?	13	13	
14. Is a desander required (xxx.38, Slurry)?	14	14	
15. If a desander is required, does the contractor have it on site and operational?	15	15	
16. Does the contractor's tremie meet the requirements of xxx.61, Tremies?	16	16	
17. Do you have the required drilled shaft forms that need to be filled out during shaft construction?	17	17	
18. Do you understand the forms (if not, contact the responsible engineer for help)	18	18	
Trial Shaft			
19. Is the trial Shaft positioned away from the production shafts or as in the contract documents (xxx.13 Trial Shaft Installation)?	19	19	
20. Has the contractor performed a successful test hole in accordance with xxx.31, Trial Shaft Installation?	20	20	
21. Did the Contractor cut off the shaft 2 feet (0.6 m) below grade in accordance with xxx.13, Trial Shaft Installation?	21	21	
22. Has the contractor revised his technique and equipment (and the revision is approved) to successfully construct a shaft?	22	22	
Shaft Excavation & Cleaning			
23. Is the shaft being constructed in the correct location & within tolerance (xxx.41, Tolerances)?	23	23	
24. Does the contractor have a bench mark so the shaft can be constructed and inspected to the proper elevations?	24	24	
25. If a core hole is required, has the contractor taken them in accordance with xxx.35.5, Excavations?	25	25	
26. If a core hole was performed, was the Rock Core Form completed and the Contractor maintained a log (xxx.35, Excavation)?	26	26	
27. If the contractor is using slurry, can they perform tests and report the results in accordance with xxx.38, Slurry?	27	27	
28. Is the slurry level being properly maintained in accordance with xxx.38, Slurry?	28	28	
29. Is the proper type and number of tests being run on the slurry in accordance with xxx.38, Slurry?	29	29	
30. Are you filling out the Soil/Rock Excavation forms?	30	30	
31. If permanent casing is used, does it meet xxx.36 & 36.2, Casing?	31	31	
32. If temporary casing is being used, does it meet xxx.36.1, Temporary Casing?	32	32	
33. If belling is required, does it meet the requirements of xxx. 35, Excavations?	33	33	
34. Is the Contractor maintaining a excavation log in accordance with xxx.35, Excavations?	34	34	
35. Is the shaft within allowable Vertical alignment tolerances (xxx.41, Construction Tolerances)?	35	35	
36. Is the shaft of proper depth?	36	36	
37. Does the shaft excavation time meet the specified time limit (xxx.34, Excavation & Drilling Equipment)?	37	37	
38. If the shaft required over reaming, was it performed in accordance with xxx.34, Excavation & Drilling Equipment?	38	38	
39. Does the shaft bottom meet the requirements of xxx.40, Excavation Inspection?	39	39	
40. Did you complete the Shaft Inspection Form?	40	40	

SAMPLE DRILLED SHAFT INSPECTOR'S CHECKLIST

The following is a general checklist to follow when constructing a Drilled Shaft. The answer to each of these should be "yes" unless plans, specifications or specific approval has been given otherwise **CONSULT WITH RESPONSIBLE ENGINEER FOR YOUR SPECIFIC PROJECT RESPONSIBILITIES.**

Reinforcing Cage	Yes	No	NA
41. Is the rebar the correct size and configured in accordance with the project plans?	<input type="checkbox"/> 41	<input type="checkbox"/> 41	
42. Is the rebar properly tied in accordance with xxx.50, Reinforcing Steel Cage Construction & Placement?	<input type="checkbox"/> 42	<input type="checkbox"/> 42	
43. Does the Contractor have the proper spacers for the steel cage in accordance with xxx.50, Reinforcing Steel Cage Construction & Placement?	<input type="checkbox"/> 43	<input type="checkbox"/> 43	
44. Does the Contractor have the proper amount of spacers for the steel cage in accordance with xxx.50, Reinforcing Steel Cage Construction & Placement?	<input type="checkbox"/> 44	<input type="checkbox"/> 44	
45. If the cage is spliced, was it done in accordance with the contract documents?	<input type="checkbox"/> 45	<input type="checkbox"/> 45	
46. Is the steel cage secured from settling and from floating (during concrete placement cages sometimes rise with the concrete) (xxx.50, Reinforcing Steel Cage Construction & Placement)?	<input type="checkbox"/> 46	<input type="checkbox"/> 46	
47. Is the top of the steel cage at the proper elevation in accordance with xxx.41, Construction Tolerances?	<input type="checkbox"/> 47	<input type="checkbox"/> 47	
Concreting Operations			
48. Prior to concrete placement, has the slurry (both manufactured & natural) been tested in accordance with xxx.38, Slurry?	<input type="checkbox"/> 48	<input type="checkbox"/> 48	
49. If required, was casing removed per xxx.36.1, Temporary Casings?	<input type="checkbox"/> 49	<input type="checkbox"/> 49	
50. Was the discharge end of the tremie maintained in the concrete mass with proper concrete head above it xxx.61, Tremies)?	<input type="checkbox"/> 50	<input type="checkbox"/> 50	
51. If free-fall placement (dry shaft only), was concrete placed in accordance with xxx.60, Concrete Placement?	<input type="checkbox"/> 51	<input type="checkbox"/> 51	
52. Did the placement occur within the time limit specified (xxx.60, Concrete Placement)?	<input type="checkbox"/> 52	<input type="checkbox"/> 52	
53. Are you filling out the concrete placement and volume forms?	<input type="checkbox"/> 53	<input type="checkbox"/> 53	
54. When placing concrete, did the Contractor overflow the shaft until good concrete flowed (xxx.60, Concrete Placement)?	<input type="checkbox"/> 54	<input type="checkbox"/> 54	
55. Were concrete acceptance tests performed as required?	<input type="checkbox"/> 55	<input type="checkbox"/> 55	
Post Installation			
56. If shaft is constructed in open water, is the shaft protected for seven days or until the concrete strength reaches a minimum of 2,500 psi (17MPa) in accordance with xxx.36, Casings?	<input type="checkbox"/> 56	<input type="checkbox"/> 56	
57. Is all casing removed to the proper elevation in accordance with xxx.36.2, Permanent Casing?	<input type="checkbox"/> 57	<input type="checkbox"/> 57	
58. Has the Contractor complied with xxx. 64, Nondestructive Evaluation, if required?	<input type="checkbox"/> 58	<input type="checkbox"/> 58	
59. Is the shaft within the applicable construction tolerances (xxx. 41, Construction Tolerances)?	<input type="checkbox"/> 59	<input type="checkbox"/> 59	
60. Has the Drilled Shaft Log been completed?	<input type="checkbox"/> 60	<input type="checkbox"/> 60	
61. Have you documented the Pay Items?	<input type="checkbox"/> 61	<input type="checkbox"/> 61	
Notes/Comments			

**THE PRE-INSPECTION &
CONSTRUCTION MEETING**

ATTEND

ATTEND

ATTEND

- Get clarification of your duties & responsibilities
- Get clarification on any issues or disagreements you found in your review of the project documents
- If documents were unclear on elevations, etc. requiring calculations on your part, present your data to Engineer for approval
- Clarify line of communication and distribution
- Clarify reports required, frequency and schedule

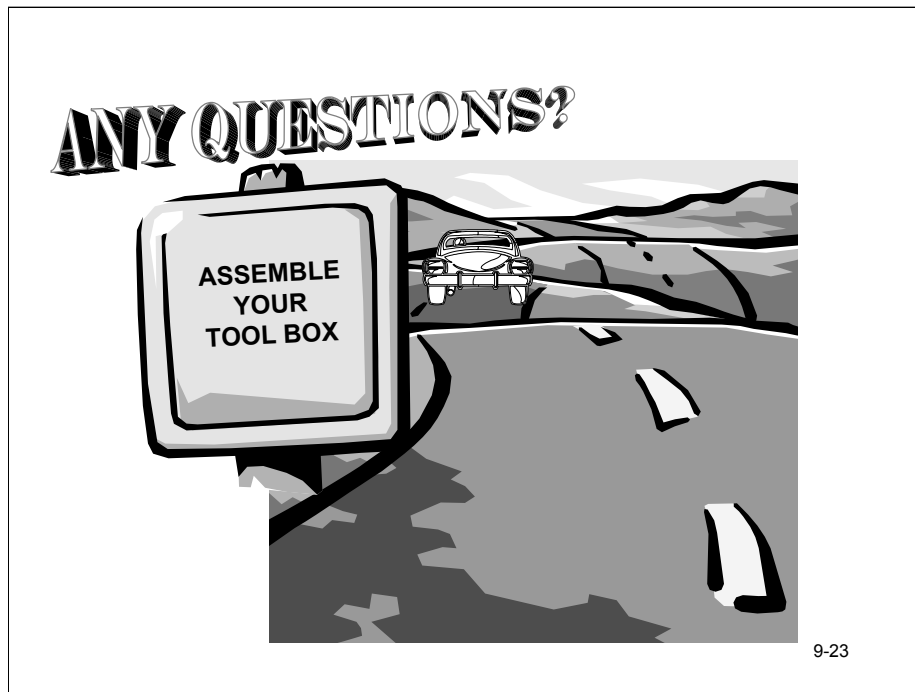
9-21

The Inspector should attend any pre-inspection and/or pre-construction meeting.

LEARNING OBJECTIVES

- **Identify the documents and tools needed by the Inspector**
- **Describe the importance of the Pre-construction meeting.**

9-22



Do you have any questions?

NOTES

[illegible]